

## Appendix C – Potential Vegetation Types and Current Vegetation Conditions

The Terrestrial Vegetation section of the Flathead National Forest (FNF) Assessment provides a summary of forest vegetation conditions on lands administered by the FNF by each of the six geographic areas. The assessment gives an overall picture of the character, abundance and distribution of the vegetation across the FNF, focused on the identified key ecosystem characteristics, such as dominance types and forest size classes. These are the characteristics deemed relevant and meaningful for addressing ecosystem conditions and for which Forest Plan components (such as desired conditions and objectives) will be developed.

This appendix expands on the existing vegetation information provided in the main assessment document, and provides a summary of forest conditions by potential vegetation type (PVT) groups. The baseline PVT classification used for this assessment is the Region 1 PVT Classification for western Montana and northern Idaho (USDA 2004). As explained in the assessment, PVTs are ecological sites that identify areas of similar climate, slope, soils, and other biophysical characteristics. The vegetation conditions, successional and disturbance patterns, and other processes within a particular PVT are similar; thus they serve as a useful means to understand the natural biodiversity across the ecosystem and landscape, both spatially and temporally. PVT groups are sometimes referred to as habitat type groups, and are assemblages of individual habitat types as identified and described by Pfister et al (1977).

Table C-1 displays the PVTs groups identified for the FNF, along with the associated tree species by successional status. PVTs are combined into different groups within the assessment as appropriate for describing the ecosystem characteristics. Table C-2 displays the different groupings of PVTs and their connection.

**Table C-1. Potential vegetation type groups, associated tree species, and acres/percent of PVT groups on FNF administered lands and on all land ownership within the planning area<sup>1</sup> (values rounded to nearest hundredth)**

PVT Group for Assessment	Principle early/mid successional species	Secondary early/mid successional species	Principle late successional species	Secondary late successional species	Total acres (acres/%) on FNF	Total acres (acres/%) on All Lands
WARM DRY	Ponderosa pine, Douglas-fir	Western larch, lodgepole pine	Douglas-fir	Grand fir	222,200 9%	459,200 14%
WARM MOIST	Douglas-fir, western larch	Lodgepole pine, western white pine, ponderosa pine, paper birch	Grand-fir, western red cedar	Subalpine fir	97,700 4%	245,600 8%
COOL WET	Spruce	Douglas-fir, western larch, western white pine	Subalpine fir	Western red cedar	53,741 2%	59,300 2%
COOL MOIST	Western larch, Douglas-fir, lodgepole pine	Western white pine	Subalpine fir, spruce	Grand fir	1,131,000 47%	1,346,500 41%
COOL MOD DRY	Lodgepole pine, Douglas-fir	Western larch	Subalpine fir	Spruce	433,100 18%	476,100 15%
COLD	Lodgepole pine, whitebark pine, spruce	--	Subalpine fir	Spruce	335,400 14%	348,100 11%
NON FOREST	--	--	--	--	121,900 5%	321,200 10%

<sup>1</sup> The *planning area* refers to all land ownership within the boundary of the six geographic areas of the FNF.

Table C-2. Potential Vegetation Type classes and groupings used for the Flathead National Forest Plan Assessment.

PVT Description – FS Region 1(USDA 2004). (specific habitat types associated with PVTs also available in assessment record)	PVT code	FNF Forest Plan Assessment PVT group	Simulation Model Habitat Type Group <sup>a</sup>	Region 1 Habitat Type Groups <sup>b</sup>	Old Growth PVT Group	Snag Analysis Habitat Type Group	Lynx Habitat Grouping	FNF HRV analysis PVT groups
<i>Abies grandis</i> (Grand Fir) moist type 2	abgr2	warm, dry	C1	Mod warm, Mod dry	warm	Dry	warm, dry	wd- psme/abgr
<i>Pinus ponderosa</i> (Ponderosa Pine) type	pipo	warm, dry	A2	Warm, dry	warm	Dry	warm, dry	wd- psme/abgr
<i>Pseudotsuga menziesii</i> (Douglas-fir) warm dry type 1	psme1	warm, dry	A2	Warm, dry	warm	Dry	warm, dry	wd- psme/abgr
<i>Pseudotsuga menziesii</i> (Douglas-fir) moist type 2	psme2	warm, dry	B2	Mod warm, dry	warm	Dry	warm, dry	wd- psme/abgr
<i>Pseudotsuga menziesii</i> (Douglas-fir) cool dry type 3	psme3	warm, dry	B1	Mod warm, dry	warm	Dry	warm, dry	wd- psme/abgr
<i>Abies grandis</i> (Grand Fir) wet type 3	abgr3	warm, moist	C2	Mod warm, moist	warm	Low-Mid Elev Moist	warm, moist	cm- psme/abgr
<i>Thuja plicata</i> (Western Red Cedar) moist type 2	thpl2	warm, moist	D1	Mod cool, moist	warm	Low-Mid Elev Moist	warm, moist	cm-thpl/tshe
<i>Abies lasiocarpa</i> (Subalpine Fir) dry type 3	abla3	cool, mod. dry	F1	Cool, mod dry	cool	Subalpine	cool, mod dry	wd-abla/pien
<i>Pinus contorta</i> (Lodgepole Pine) type	pico	cool, mod. dry	F1	Cool, mod dry	cool	Subalpine	cool, mod dry	pico (wd- abla/pien)
<i>Tsuga mertensiana</i> (Mtn. Hemlock) with WBP in MT	tsme2	cool, mod. dry	D3b	Cold, Moist to Mod dry	cool	Subalpine	cool, moist	hc-abla/pien
<i>Abies lasiocarpa</i> (Subalpine Fir) moist type 2	abla2	cool, moist	D3b	Cool, moist	cool	Subalpine	cool, moist	cm-abla/pien
<i>Abies lasiocarpa</i> (Subalpine Fir) moist type 2	abla2	cool, moist	D3a	Cool, moist	cool	Subalpine	cool, moist	cm-abla/pien
<i>Picea</i> (Spruce) species type	picea	cool, moist	D3a	Cool, moist	cool	Subalpine	cool, moist	cm-abla/pien
<i>Tsuga heterophylla</i> (western Hemlock) type	tshe	cool, moist	D1	Cool, moist	cool	Low-Mid Elev Moist	cool, moist	cm-thpl/tshe
<i>Abies lasiocarpa</i> (Subalpine Fir) wet type 1	abla1	cool, wet	E2	Cool, wet	cool	Subalpine	cool, wet	cm-abla/pien
<i>Thuja plicata</i> (Western Red Cedar) wet type 1	thpl1	cool, wet	E1	Mod cool, wet	cool	Low-Mid Elev Moist	cool, wet	cm-thpl/tshe

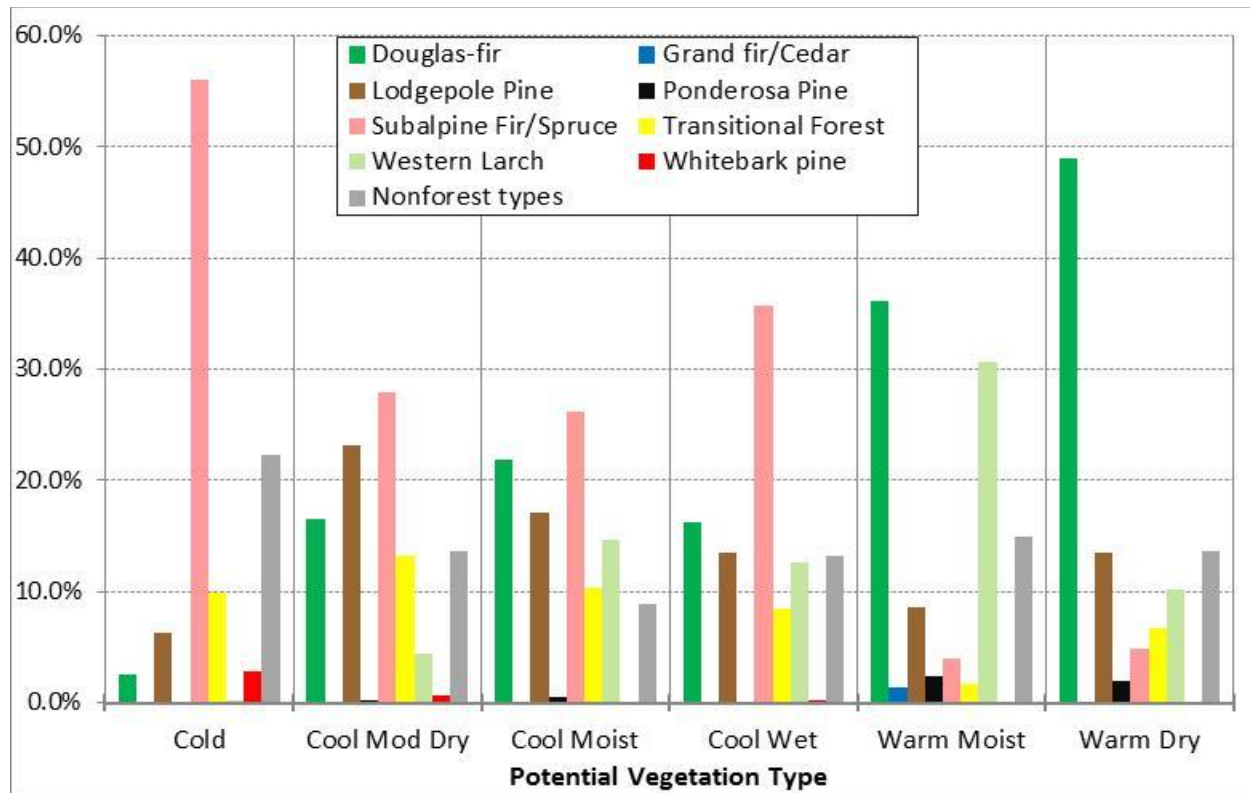
PVT Description – FS Region 1(USDA 2004). (specific habitat types associated with PVTs also available in assessment record)	PVT code	FNF Forest Plan Assessment PVT group	Simulation Model Habitat Type Group <sup>a</sup>	Region 1 Habitat Type Groups <sup>b</sup>	Old Growth PVT Group	Snag Analysis Habitat Type Group	Lynx Habitat Grouping	FNF HRV analysis PVT groups
<i>Abies lasiocarpa</i> (Subalpine Fir) cold type 4	abla4	cold	G1	Cold, Moist to Mod dry	cold	Subalpine	cold	hc-abla/pien
<i>Larix lyallii</i> (Subalpine Larch) type	laly	cold	G2	Cold, near timberline	cold	Subalpine	cold	hc-abla/pien
<i>Pinus albicaulis</i> (Whitebark Pine) type	pial	cold	G2	Cold, near timberline	cold	Subalpine	cold	hc-abla/pien
<i>Populus tremuloides</i> (Aspen) and upland deciduous type	poptre	NF-Decid	NF	Hardwood, Mtn bottomlands	nonfor	na	non-forest, hardwood	hdwd
Riparian deciduous forest type	ripdecid	NF -Decid	NF	Hardwood, Mtn bottomlands	nonfor	na	na	hdwd
Alpine and alpine grassland type	alpine	NF -Grass	NF	Alpine meadows	nonfor	na	na	grass/shrub
Dry species grassland type	Dry grass	NF-Grass	NF	Grassland	nonfor	na	na	grass/shrub
<i>Festuca idahoensis</i> (Idaho Fescue) grassland type	fesida	NF-Grass	NF	Grassland	nonfor	na	na	grass/shrub
<i>Festuca scabrella</i> (Rough Fescue) grassland type	fessca	NF-Grass	NF	Grassland	nonfor	na	na	grass/shrub
Mesic species shrubland type	Mesic shrub	NF-Shrub	NF	Mtn bottomlands	nonfor	na	na	grass/shrub
Rock, talus/scree, barren areas, and mines	Sparse veg	NF-Rock/ Barren	NF	Rock/Scree	nonfor	na	na	nf
Agricultural lands	Agri- culture	NF- Developed	NF	Agric	nonfor	na	na	nf
Urbanized areas (cities and towns)	urban	NF- Developed	NF	Rural/urban	nonfor	na	na	nf
Water, lakes, reservoirs, and wide rivers	water	NF-Water	NF	Water	nonfor	na	na	nf

<sup>a</sup> Habitat type groups (~PVTs) used for the SIMPLLE modeling (SIMulating Patterns and Processes at Landscape scaLEs), a spatially-interactive, dynamic landscape modeling system for projecting temporal changes in the spatial distribution of vegetation in response to disturbances.

<sup>b</sup> USDA, Forest Service. 2005. Biophysical Classification – Habitat Type Groups and Descriptions of Northern Idaho and Northwestern Montana, Lower Clark Fork and Adjacent Areas. Region 1 Vegetation Classification, Inventory and Analysis Report 09-08.

Appendix A of the assessment provides maps of the PVT groups for each geographic area on the FNF. The figures (C-1 and C-2) and tables (C-3 through C-7) that follow in this appendix summarize vegetation dominance types and size classes within the PVT groups across the forest.

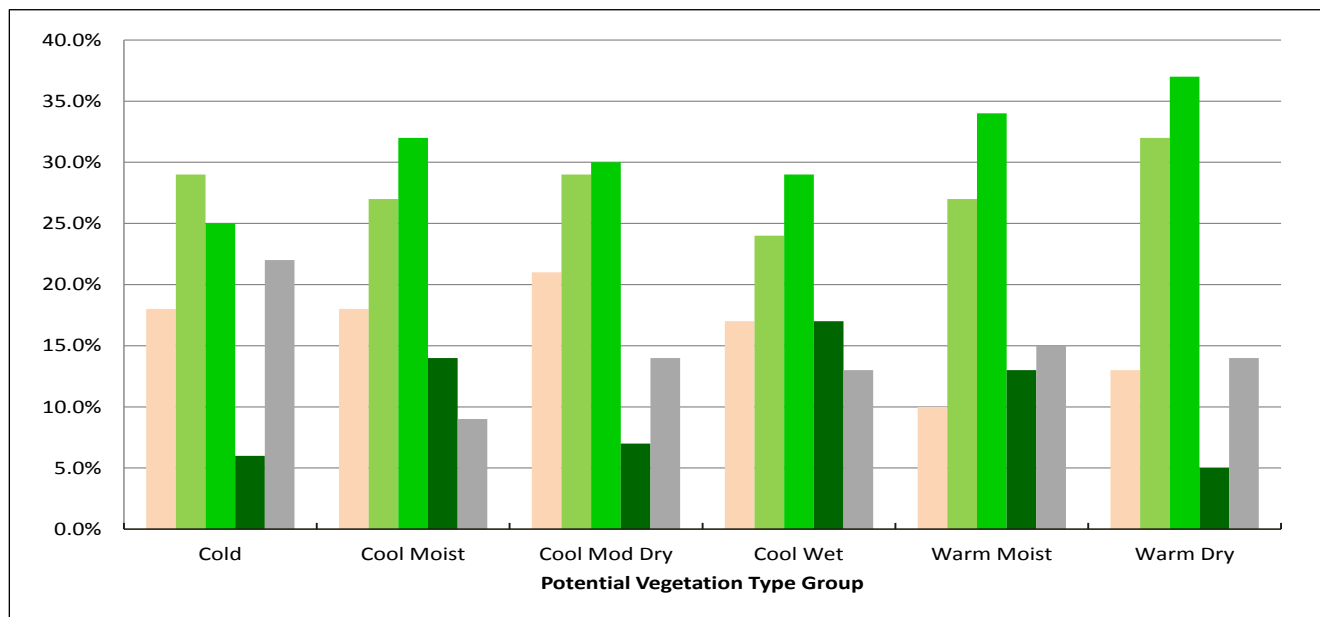
**Figure C-1. Percent of the vegetation dominance types by PVT groups in the planning area.**



**Table C-3. Acres of vegetation dominance types by PVT groups in the planning area.**

Vegetation Dominance Type	Potential Vegetation Type Groups						
	Cold	Cool Mod Dry	Cool Moist	Cool Wet	Warm Moist	Warm Dry	Non Forest PVTs <sup>a</sup>
Douglas-fir	8733	78895	294666	9573	88827	224854	3738
Grand fir/Cedar	0	10	487	36	3295	94	0
Lodgepole Pine	21747	110327	230809	7973	20973	61762	805
Ponderosa Pine	0	1129	6867	11	5854	9026	1798
Subalpine Fir/Spruce	194938	132848	352978	21111	9646	21953	18089
Transitional Forest	34608	62695	139307	4968	4069	31019	2148
Western Larch	529	20948	197446	7515	75164	46499	561
Whitebark pine	9699	3345	1543	93	0	60	1247
Nonforest types	77605	65200	119258	7844	36747	62390	230226
<b>TOTAL</b>	<b>347859</b>	<b>475397</b>	<b>1343361</b>	<b>59124</b>	<b>244575</b>	<b>457657</b>	<b>258612</b>

<sup>a</sup>Forest dominance types are mapped on a minor amount (about 11%) of the Non-forest PVTs. This is attributed both to mapping anomalies and to the small inclusions of forest types that occur within some non-forest PVT map units.

**Figure C-2. Percent of forest size class by PVT groups in the planning area.****Table C-4. Acres of forest size class by PVT groups in the planning area.**

Forest Size Classes	Potential Vegetation Type Groups						Forest Wide acres
	Cold	Cool Moist	Cool Mod Dry	Cool Wet	Warm Moist	Warm Dry	
Seed/Sapling (<5" d.b.h.)	62,407	246,224	98,927	9,787	25,578	59,938	510,538
Small Tree (5-9" d.b.h.)	101,523	357,875	136,780	14,184	67,025	145,159	833,190
Med Tree (10-15" d.b.h.)	85,400	432,930	142,601	16,958	83,169	167,261	936,682
Large Tree (>15" d.b.h.)	20,924	187,076	31,889	10,350	32,053	22,909	306,904
NonForest	77,605	119,258	65,200	7,844	36,747	62,390	599,271
Total	347,859	1,343,363	475,397	59,123	244,572	457,657	3,186,585
water	194	3,162	715	136	1,021	1,526	69,384
GRAND TOTAL	348,053	1,346,525	476,112	59,259	245,593	459,183	3,255,969

For additional reference, acres of PVTs within each geographic area (GA) are displayed in table C-5. These GAs are referenced by their abbreviation in the discussions within this appendix

**Table C-5. Acres of PVT group by FNF Geographic Areas in the planning area.**

Geographic Units on the FNF	Potential Vegetation Type Groups						Non-Forest
	Cold	Cool Mod Dry	Cool Moist	Cool Wet	Warm Moist	Warm Dry	
HH - Hungry Horse	17,136	35,371	207,131	10,414	8,064	16,159	37,575
MFk - Middle Fork	53,028	102,692	164,674	12,821	86	17,756	24,179
NFk - North Fork	70,362	49,591	215,040	11,837	22,560	10,946	9,328
SMt - Salish Mtns	10,460	65,456	279,102	7,572	69,188	255,809	149,094
SFk - South Fork	163,664	166,827	281,379	11,656	460	109,086	57,649
SV - Swan Valley	33,403	56,175	199,198	4,958	145,236	49,427	43,416
TOTAL	348,053	476,112	1,346,524	59,259	245,595	459,184	321,242

Table C-6 displays the vegetation dominance type and size class combinations broken out by each PVT group. This information provides insight into the diversity of forest conditions across the landscape and the inter-relationship of tree species/dominance types to forest size classes.

**Table C-6. Vegetation dominance type and tree size class combinations: Acres and percent by PVT group within the planning area.**

<b>COLD PVT SIZE CLASSES BY DOMINANCE TYPE</b>	<b>Total Acres</b>	<b>Percent within the COLD PVT</b>	<b>Percent within the Dominance Type category</b>
<b>Douglas-fir</b>	<b>8733</b>	<b>2.51%</b>	
DBH >=15; LARGE TREE	677	0.19%	7.75%
DBH 0-4.9; SEED/SAPL	765	0.22%	8.76%
DBH 10-14.9; MEDIUM TREE	5455	1.57%	62.47%
DBH 5-9.9; SMALL TREE	1837	0.53%	21.03%
<b>Lodgepole Pine</b>	<b>21747</b>	<b>6.25%</b>	
DBH >=15; LARGE TREE	25	0.01%	0.11%
DBH 0-4.9; SEED/SAPL	1161	0.33%	5.34%
DBH 10-14.9; MEDIUM TREE	5048	1.45%	23.21%
DBH 5-9.9; SMALL TREE	15514	4.46%	71.34%
<b>Subalpine Fir/Spruce</b>	<b>194938</b>	<b>56.01%</b>	
DBH >=15; LARGE TREE	20103	5.78%	10.31%
DBH 0-4.9; SEED/SAPL	24702	7.10%	12.67%
DBH 10-14.9; MEDIUM TREE	71536	20.55%	36.70%
DBH 5-9.9; SMALL TREE	78598	22.58%	40.32%
<b>Western Larch</b>	<b>529</b>	<b>0.15%</b>	
DBH >=15; LARGE TREE	104	0.03%	19.65%
DBH 0-4.9; SEED/SAPL	253	0.07%	47.94%
DBH 10-14.9; MEDIUM TREE	91	0.03%	17.29%
DBH 5-9.9; SMALL TREE	80	0.02%	15.12%
<b>Whitebark pine</b>	<b>9699</b>	<b>2.79%</b>	
DBH >=15; LARGE TREE	16	0.00%	0.17%
DBH 0-4.9; SEED/SAPL	918	0.26%	9.46%
DBH 10-14.9; MEDIUM TREE	3270	0.94%	33.72%
DBH 5-9.9; SMALL TREE	5495	1.58%	56.65%
<b>Transitional Forest (seed/sapl)</b>	<b>34608</b>	<b>9.94%</b>	
TRANSITIONAL FOREST (SEED/SAPL)	34608	9.94%	100.00%
<b>Grass/Shrub/SparseVeg</b>	<b>77578</b>	<b>22.29%</b>	
HERBACEOUS	42824	12.30%	55.20%
SHRUB	12062	3.47%	15.55%
SPARSE VEGETATION	22692	6.52%	29.25%
<b>Hardwood (Cottonwood/aspen)</b>	<b>27</b>	<b>0.01%</b>	
DECIDUOUS TREE	27	0.01%	100.00%
<b>Water</b>	<b>194</b>	<b>0.06%</b>	
WATER	194	0.06%	100.00%
<b>Grand Total</b>	<b>348053</b>	<b>100.00%</b>	

<b>COOL MOD DRY PVT SIZE CLASSES BY DOMINANCE TYPE</b>	<b>Total Acres</b>	<b>Percent within the COOL MOD DRY PVT</b>	<b>Percent within the Dominance Type category</b>
<b>Douglas-fir</b>	<b>78895</b>	<b>16.57%</b>	
DBH >=15; LARGE TREE	7128	1.50%	9.03%
DBH 0-4.9; SEED/SAPL	5570	1.17%	7.06%
DBH 10-14.9; MEDIUM TREE	50105	10.52%	63.51%
DBH 5-9.9; SMALL TREE	16091	3.38%	20.40%
<b>Grand fir/Cedar</b>	<b>10</b>	<b>0.00%</b>	
DBH 10-14.9; MEDIUM TREE	10	0.00%	100.00%
<b>Grass/Shrub/SparseVeg</b>	<b>63726</b>	<b>13.38%</b>	
HERBACEOUS	30363	6.38%	47.65%
SHRUB	19247	4.04%	30.20%
SPARSE VEGETATION	14116	2.96%	22.15%

<b>COOL MOD DRY PVT SIZE CLASSES BY DOMINANCE TYPE</b>	<b>Total Acres</b>	<b>Percent within the COOL MOD DRY PVT</b>	<b>Percent within the Dominance Type category</b>
<b>Hardwood (Cottonwood/aspen)</b>	<b>1473</b>	<b>0.31%</b>	
DECIDUOUS TREE	1473	0.31%	100.00%
<b>Lodgepole Pine</b>	<b>110327</b>	<b>23.17%</b>	
DBH >=15; LARGE TREE	1141	0.24%	1.03%
DBH 0-4.9; SEED/SAPL	11562	2.43%	10.48%
DBH 10-14.9; MEDIUM TREE	32156	6.75%	29.15%
DBH 5-9.9; SMALL TREE	65468	13.75%	59.34%
<b>Ponderosa Pine</b>	<b>1129</b>	<b>0.24%</b>	
DBH >=15; LARGE TREE	150	0.03%	13.30%
DBH 0-4.9; SEED/SAPL	4	0.00%	0.38%
DBH 10-14.9; MEDIUM TREE	684	0.14%	60.61%
DBH 5-9.9; SMALL TREE	290	0.06%	25.71%
<b>Subalpine Fir/Spruce</b>	<b>132848</b>	<b>27.90%</b>	
DBH >=15; LARGE TREE	22173	4.66%	16.69%
DBH 0-4.9; SEED/SAPL	13574	2.85%	10.22%
DBH 10-14.9; MEDIUM TREE	51915	10.90%	39.08%
DBH 5-9.9; SMALL TREE	45186	9.49%	34.01%
<b>Transitional Forest (seed/sapl)</b>	<b>62695</b>	<b>13.17%</b>	
TRANSITIONAL FOREST (SEED/SAPL)	62695	13.17%	100.00%
<b>Water</b>	<b>715</b>	<b>0.15%</b>	
WATER	715	0.15%	100.00%
<b>Western Larch</b>	<b>20948</b>	<b>4.40%</b>	
DBH >=15; LARGE TREE	1281	0.27%	6.12%
DBH 0-4.9; SEED/SAPL	5248	1.10%	25.05%
DBH 10-14.9; MEDIUM TREE	6931	1.46%	33.09%
DBH 5-9.9; SMALL TREE	7488	1.57%	35.75%
<b>Whitebark pine</b>	<b>3345</b>	<b>0.70%</b>	
DBH >=15; LARGE TREE	15	0.00%	0.46%
DBH 0-4.9; SEED/SAPL	274	0.06%	8.19%
DBH 10-14.9; MEDIUM TREE	800	0.17%	23.92%
DBH 5-9.9; SMALL TREE	2256	0.47%	67.43%
<b>Grand Total</b>	<b>476112</b>	<b>100.00%</b>	

<b>COOL MOIST PVT SIZE CLASSES BY DOMINANCE TYPE</b>	<b>Total Acres</b>	<b>Percent within the COOL MOIST PVT</b>	<b>Percent within the Dominance Type category</b>
<b>Douglas-fir</b>	<b>294666</b>	<b>21.88%</b>	
DBH >=15; LARGE TREE	40930	3.04%	13.89%
DBH 0-4.9; SEED/SAPL	18392	1.37%	6.24%
DBH 10-14.9; MEDIUM TREE	167381	12.43%	56.80%
DBH 5-9.9; SMALL TREE	67962	5.05%	23.06%
<b>Grand fir/Cedar</b>	<b>487</b>	<b>0.04%</b>	
DBH >=15; LARGE TREE	209	0.02%	42.79%
DBH 10-14.9; MEDIUM TREE	202	0.02%	41.44%
DBH 5-9.9; SMALL TREE	77	0.01%	15.77%
<b>Grass/Shrub/SparseVeg</b>	<b>105518</b>	<b>7.84%</b>	
HERBACEOUS	35974	2.67%	34.09%
SHRUB	43862	3.26%	41.57%
SPARSE VEGETATION	25682	1.91%	24.34%
<b>Hardwood (Cottonwood/aspen)</b>	<b>13740</b>	<b>1.02%</b>	
DECIDUOUS TREE	13740	1.02%	100.00%
<b>Lodgepole Pine</b>	<b>230809</b>	<b>17.14%</b>	
DBH >=15; LARGE TREE	2921	0.22%	1.27%
DBH 0-4.9; SEED/SAPL	35841	2.66%	15.53%
DBH 10-14.9; MEDIUM TREE	65945	4.90%	28.57%
DBH 5-9.9; SMALL TREE	126102	9.36%	54.63%
<b>Ponderosa Pine</b>	<b>6867</b>	<b>0.51%</b>	

<b>COOL MOIST PVT SIZE CLASSES BY DOMINANCE TYPE</b>	<b>Total Acres</b>	<b>Percent within the COOL MOIST PVT</b>	<b>Percent within the Dominance Type category</b>
DBH >=15; LARGE TREE	1398	0.10%	20.36%
DBH 0-4.9; SEED/SAPL	396	0.03%	5.77%
DBH 10-14.9; MEDIUM TREE	2486	0.18%	36.21%
DBH 5-9.9; SMALL TREE	2586	0.19%	37.66%
<b>Subalpine Fir/Spruce</b>	<b>352978</b>	<b>26.21%</b>	
DBH >=15; LARGE TREE	115011	8.54%	32.58%
DBH 0-4.9; SEED/SAPL	17479	1.30%	4.95%
DBH 10-14.9; MEDIUM TREE	135925	10.09%	38.51%
DBH 5-9.9; SMALL TREE	84563	6.28%	23.96%
<b>Transitional Forest (seed/sapl)</b>	<b>139307</b>	<b>10.35%</b>	
TRANSITIONAL FOREST (SEED/SAPL)	139307	10.35%	100.00%
<b>Water</b>	<b>3162</b>	<b>0.23%</b>	
WATER	3162	0.23%	100.00%
<b>Western Larch</b>	<b>197446</b>	<b>14.66%</b>	
DBH >=15; LARGE TREE	26606	1.98%	13.48%
DBH 0-4.9; SEED/SAPL	34675	2.58%	17.56%
DBH 10-14.9; MEDIUM TREE	60443	4.49%	30.61%
DBH 5-9.9; SMALL TREE	75722	5.62%	38.35%
<b>Whitebark pine</b>	<b>1543</b>	<b>0.11%</b>	
DBH 0-4.9; SEED/SAPL	133	0.01%	8.65%
DBH 10-14.9; MEDIUM TREE	547	0.04%	35.44%
DBH 5-9.9; SMALL TREE	863	0.06%	55.91%
<b>Grand Total</b>	<b>1346524</b>	<b>100.00%</b>	

<b>COOL WET PVT SIZE CLASSES BY DOMINANCE TYPE</b>	<b>Total Acres</b>	<b>Percent within the COOL WET PVT</b>	<b>Percent within the Dominance Type category</b>
<b>Douglas-fir</b>	<b>9573</b>	<b>16.15%</b>	
DBH >=15; LARGE TREE	1594	2.69%	16.65%
DBH 0-4.9; SEED/SAPL	727	1.23%	7.59%
DBH 10-14.9; MEDIUM TREE	5407	9.12%	56.48%
DBH 5-9.9; SMALL TREE	1845	3.11%	19.27%
<b>Grand fir/Cedar</b>	<b>36</b>	<b>0.06%</b>	<b>0.06%</b>
DBH >=15; LARGE TREE	18	0.03%	49.17%
DBH 10-14.9; MEDIUM TREE	18	0.03%	50.83%
<b>Grass/Shrub/SparseVeg</b>	<b>7183</b>	<b>12.12%</b>	
HERBACEOUS	2828	4.77%	39.37%
SHRUB	3264	5.51%	45.44%
SPARSE VEGETATION	1091	1.84%	15.19%
<b>Hardwood (Cottonwood/aspen)</b>	<b>660</b>	<b>1.11%</b>	
DECIDUOUS TREE	660	1.11%	100.00%
<b>Lodgepole Pine</b>	<b>7973</b>	<b>13.45%</b>	
DBH >=15; LARGE TREE	83	0.14%	1.04%
DBH 0-4.9; SEED/SAPL	1139	1.92%	14.28%
DBH 10-14.9; MEDIUM TREE	2657	4.48%	33.33%
DBH 5-9.9; SMALL TREE	4094	6.91%	51.35%
<b>Ponderosa Pine</b>	<b>11</b>	<b>0.02%</b>	
DBH 0-4.9; SEED/SAPL	2	0.00%	15.38%
DBH 10-14.9; MEDIUM TREE	9	0.02%	84.62%
<b>Subalpine Fir/Spruce</b>	<b>21111</b>	<b>35.62%</b>	
DBH >=15; LARGE TREE	7182	12.12%	34.02%
DBH 0-4.9; SEED/SAPL	1425	2.41%	6.75%
DBH 10-14.9; MEDIUM TREE	6929	11.69%	32.82%
DBH 5-9.9; SMALL TREE	5575	9.41%	26.41%
<b>Transitional Forest (seed/sapl)</b>	<b>4968</b>	<b>8.38%</b>	
TRANSITIONAL FOREST (SEED/SAPL)	4968	8.38%	100.00%
<b>Water</b>	<b>136</b>	<b>0.23%</b>	



COOL WET PVT SIZE CLASSES BY DOMINANCE TYPE	Total Acres	Percent within the COOL WET PVT	Percent within the Dominance Type category
WATER	136	0.23%	100.00%
<b>Western Larch</b>	<b>7515</b>	<b>12.68%</b>	
DBH >=15; LARGE TREE	1473	2.49%	19.61%
DBH 0-4.9; SEED/SAPL	1522	2.57%	20.25%
DBH 10-14.9; MEDIUM TREE	1900	3.21%	25.29%
DBH 5-9.9; SMALL TREE	2619	4.42%	34.85%
<b>Whitebark pine</b>	<b>93</b>	<b>0.16%</b>	
DBH 0-4.9; SEED/SAPL	5	0.01%	4.98%
DBH 10-14.9; MEDIUM TREE	37	0.06%	39.77%
DBH 5-9.9; SMALL TREE	51	0.09%	55.25%
<b>Grand Total</b>	<b>59259</b>	<b>100.00%</b>	
WARM MOIST PVT SIZE CLASSES BY DOMINANCE TYPE	Total Acres	Percent within the WARM MOIST PVT	Percent within the Dominance Type category
<b>Douglas-fir</b>	<b>88827</b>	<b>36.17%</b>	
DBH >=15; LARGE TREE	12966	5.28%	14.60%
DBH 0-4.9; SEED/SAPL	5208	2.12%	5.86%
DBH 10-14.9; MEDIUM TREE	48079	19.58%	54.13%
DBH 5-9.9; SMALL TREE	22573	9.19%	25.41%
<b>Grand fir/Cedar</b>	<b>3295</b>	<b>1.34%</b>	
DBH >=15; LARGE TREE	978	0.40%	29.69%
DBH 0-4.9; SEED/SAPL	39	0.02%	1.18%
DBH 10-14.9; MEDIUM TREE	1791	0.73%	54.37%
DBH 5-9.9; SMALL TREE	486	0.20%	14.76%
<b>Grass/Shrub/SparseVeg</b>	<b>22706</b>	<b>9.25%</b>	
HERBACEOUS	8424	3.43%	37.10%
SHRUB	5748	2.34%	25.31%
SPARSE VEGETATION	8534	3.47%	37.59%
<b>Hardwood (Cottonwood/aspen)</b>	<b>14041</b>	<b>5.72%</b>	
DECIDUOUS TREE	14041	5.72%	100.00%
<b>Lodgepole Pine</b>	<b>20973</b>	<b>8.54%</b>	
DBH >=15; LARGE TREE	884	0.36%	4.22%
DBH 0-4.9; SEED/SAPL	4499	1.83%	21.45%
DBH 10-14.9; MEDIUM TREE	5484	2.23%	26.15%
DBH 5-9.9; SMALL TREE	10105	4.11%	48.18%
<b>Ponderosa Pine</b>	<b>5854</b>	<b>2.38%</b>	
DBH >=15; LARGE TREE	1399	0.57%	23.90%
DBH 0-4.9; SEED/SAPL	436	0.18%	7.45%
DBH 10-14.9; MEDIUM TREE	2178	0.89%	37.21%
DBH 5-9.9; SMALL TREE	1840	0.75%	31.44%
<b>Subalpine Fir/Spruce</b>	<b>9646</b>	<b>3.93%</b>	
DBH >=15; LARGE TREE	4840	1.97%	50.18%
DBH 0-4.9; SEED/SAPL	253	0.10%	2.63%
DBH 10-14.9; MEDIUM TREE	3293	1.34%	34.14%
DBH 5-9.9; SMALL TREE	1259	0.51%	13.06%
<b>Transitional Forest (seed/sapl)</b>	<b>4069</b>	<b>1.66%</b>	
TRANSITIONAL FOREST (SEED/SAPL)	4069	1.66%	100.00%
<b>Water</b>	<b>1021</b>	<b>0.42%</b>	
WATER	1021	0.42%	100.00%
<b>Western Larch</b>	<b>75164</b>	<b>30.60%</b>	
DBH >=15; LARGE TREE	10986	4.47%	14.62%
DBH 0-4.9; SEED/SAPL	11075	4.51%	14.73%
DBH 10-14.9; MEDIUM TREE	22343	9.10%	29.73%
DBH 5-9.9; SMALL TREE	30760	12.52%	40.92%
<b>Grand Total</b>	<b>245595</b>	<b>100.00%</b>	<b>100.00%</b>

WARM DRY PVT SIZE CLASSES BY DOMINANCE TYPE	Total Acres	Percent within the WARM DRY PVT	Percent within the Dominance Type category
<b>Douglas-fir</b>	<b>224854</b>	<b>48.97%</b>	
DBH >=15; LARGE TREE	12589	2.74%	5.60%
DBH 0-4.9; SEED/SAPL	9010	1.96%	4.01%
DBH 10-14.9; MEDIUM TREE	127645	27.80%	56.77%
DBH 5-9.9; SMALL TREE	75610	16.47%	33.63%
<b>Grand fir/Cedar</b>	<b>94</b>	<b>0.02%</b>	
DBH >=15; LARGE TREE	16	0.00%	16.99%
DBH 10-14.9; MEDIUM TREE	64	0.01%	68.10%
DBH 5-9.9; SMALL TREE	14	0.00%	14.92%
<b>Grass/Shrub/SparseVeg</b>	<b>54234</b>	<b>11.81%</b>	
HERBACEOUS	22283	4.85%	41.09%
SHRUB	15055	3.28%	27.76%
SPARSE VEGETATION	16896	3.68%	31.15%
<b>Hardwood (Cottonwood/aspen)</b>	<b>8156</b>	<b>1.78%</b>	
DECIDUOUS TREE	8156	1.78%	100.00%
<b>Lodgepole Pine</b>	<b>61762</b>	<b>13.45%</b>	
DBH >=15; LARGE TREE	800	0.17%	1.30%
DBH 0-4.9; SEED/SAPL	7200	1.57%	11.66%
DBH 10-14.9; MEDIUM TREE	16852	3.67%	27.29%
DBH 5-9.9; SMALL TREE	36910	8.04%	59.76%
<b>Ponderosa Pine</b>	<b>9026</b>	<b>1.97%</b>	
DBH >=15; LARGE TREE	1411	0.31%	15.63%
DBH 0-4.9; SEED/SAPL	867	0.19%	9.60%
DBH 10-14.9; MEDIUM TREE	2648	0.58%	29.34%
DBH 5-9.9; SMALL TREE	4100	0.89%	45.43%
<b>Subalpine Fir/Spruce</b>	<b>21953</b>	<b>4.78%</b>	
DBH >=15; LARGE TREE	5743	1.25%	26.16%
DBH 0-4.9; SEED/SAPL	1361	0.30%	6.20%
DBH 10-14.9; MEDIUM TREE	9863	2.15%	44.93%
DBH 5-9.9; SMALL TREE	4985	1.09%	22.71%
<b>Transitional Forest (seed/sapl)</b>	<b>31019</b>	<b>6.76%</b>	
TRANSITIONAL FOREST (SEED/SAPL)	31019	6.76%	100.00%
<b>Water</b>	<b>1526</b>	<b>0.33%</b>	
WATER	1526	0.33%	100.00%
<b>Western Larch</b>	<b>46499</b>	<b>10.13%</b>	
DBH >=15; LARGE TREE	2350	0.51%	5.05%
DBH 0-4.9; SEED/SAPL	10479	2.28%	22.54%
DBH 10-14.9; MEDIUM TREE	10162	2.21%	21.85%
DBH 5-9.9; SMALL TREE	23508	5.12%	50.56%
<b>Whitebark pine</b>	<b>60</b>	<b>0.01%</b>	
DBH 0-4.9; SEED/SAPL	1	0.00%	1.95%
DBH 10-14.9; MEDIUM TREE	27	0.01%	44.82%
DBH 5-9.9; SMALL TREE	32	0.01%	53.23%
<b>Grand Total</b>	<b>459184</b>	<b>100.00%</b>	

NON-FOREST PVTs	Total Acres	Percent within the Non-Forest PVT	
<b>Grass/Shrub/ SparseVeg/Hrdwd</b>	230227	72%	Considered a persistent non forest types due to: (a) site capability (about 20-40% of this PVT, due to poor/shallow soils, cold high elevations, rocklands; (b) agricultural or human developments (about 23% of this PVT); or (c) disturbance frequency (e.g. avalanche chutes/fans, about 12% of the PVT).
<b>Forested</b>	28386	9%	Forest types according to VMap mapping. Apparent discrepancy due to: (a) normal mapping mismatches, or differences in mapping protocol between the two data layers; or (b) some are marginal sites with low tree canopy cover (~30% of these polygons have <40% crown cover)
<b>Water</b>	62630	19%	
<b>Grand Total</b>	<b>321243</b>		

## Discussion

This section provides a short description of the forest vegetation and disturbances characteristic of the particular PVT, and the forest conditions currently within the PVT. Vegetation dominance types, forest size classes and associated structural characteristics are the key ecosystem characteristics discussed in this appendix. To reiterate the clarification provided in the assessment document, forest size classes are used as a surrogate for evaluating the forest successional (or “seral”) stages. This is an imperfect match, but serves as the best available means at this coarse scale of analysis to describe forest development through time.

Information sources that provided localized and specific information relative to the sites (PVTs) and forest types of the FNF were consulted for these descriptions. They include Fischer and Bradley (1987), where the role of fire and forest successional pathways are discussed by Fire Groups; Pfister et al (1977), describing forest conditions for individual habitat types, which when grouped form the PVTs used in this assessment; and the Southwest Crown of the Continent [SWCC] Landscape Assessment (Mehl et al 2012), describing native forest conditions and response to fire for a large landscape in north-central Montana that includes a portion of the Swan Valley GA. Local knowledge of this author, with over 30 years field experience as a silviculturist in this region of Montana, was also put to use.

Considerable complexity of vegetation composition and structure exists naturally within a PVT group, especially when considering conditions over time and space, and how the different components of an ecosystem influence or inter-relate to one another. At this coarse scale of a forest-wide assessment, a generalized discussion of forest conditions will be provided, with a focus on fire as the primary disturbance process and driver of vegetation change in this ecosystem. The references listed in the previous paragraph should be consulted for more in depth discussion of the diversity of forest conditions within a PVT, and the variation in forest response to fire. The SWCC Landscape Assessment in particular provides a concise and meaningful portrayal of change to native plant communities over time in response to fire as a primary ecosystem process (“disturbance states”) of individual ecological sites (e.g. PVTs). It is important to recognize the relationship of disturbances (particularly fire) to forest structure, composition and successional pathways over time in order to understand native ecosystem diversity and predict potential future changes in vegetation conditions. A complete copy of the SWCC Landscape Assessment is available at the website <http://emri.org/>.

Because the Fire Groups in the Fischer and Bradley publication, and the ecological sites of the SWCC Landscape Assessment use slightly different grouping protocol and labeling of PVTs than this FNF assessment, table C-7 is provided below for ease of reference to the information in those key documents. In addition, maps displaying the PVT groups for each of the six geographic areas on the FNF are provided in appendix A of the assessment.

Table C-7. Crosswalk table between FNF assessment PVT groups, Fischer and Bradley Fire Groups, and Southwest Crown of the Continent Landscape Assessment ecological sites.

FNF Forest Plan Assessment PVT group	Fire Groups	SWCC Landscape Assessment (Mehl et al 2012) Ecological Sites
warm, dry	(4), 6	WARM-DRY; WARM-MOIST
warm, moist	11	MOD WARM-DRY; MOD WARM-MOIST
cool, mod. dry	7, 8	COOL-DRY
cool, moist	9	COOL-MOIST
cool, wet	9 (AF), 11 (Cedar)	(none)
cold	10	COLD-DRY; COLD-MOIST

### **Cold PVT group**

This group is composed of forests growing at highest elevations of the forest, on cold sites with short growing seasons. Precipitation amounts are often high, but predominantly snow that may persist well into June and return

again in September. Soils are frequently shallow, with non-forest rocklands, alpine meadows and shrub-dominated areas interspersed in a patch-mosaic with the forest types.

Subalpine fir, spruce, whitebark pine and lodgepole pine are most common. Localized populations of alpine larch also exist, and a few areas contain mountain hemlock. Sites are generally above the elevational limits of Douglas-fir and western larch, though some of the more moderate growing sites within this PVT will support Douglas-fir. Common understory plants include grouse whortleberry, menziesia, beargrass, and sedges and rushes.

Lethal and mixed severity fire regimes characterize these sites. The cold, moist, rocky, snowy environment; the discontinuity of vegetation types and fine surface fuels; and the rain that commonly accompanies storm events are primary factors that limit both the frequency and the areal extent of fire. Whitebark pine in particular is well adapted to prospering in these forests under either low or high severity fire events. It is more resistant to fire damage and mortality than its associates and it has a unique method of seed dispersal that can profit from fire. Whitebark pine's large seeds are disseminated by the Clark's nutcracker, a bird that removes the seed from the cones and buries (caches) them in the surrounding landscape, for use as a future food source. Open, exposed areas, such as recently burned sites, seem to be favored sites for caching. Many of these seeds are never retrieved by the bird and are left to germinate and grow. Whitebark pine can tolerate the cold winds and harsh site conditions and provide sheltered sites and protection so subalpine fir and spruce can become established.

### **Existing FNF forest conditions in the Cold PVT**

The forest dominance type distribution is very heavily skewed towards subalpine fir/spruce, which comprises more than 70% of the forest types. Tree species diversity is naturally more limited on these high elevation sites, and subalpine fir in particular is well adapted and has historically been a dominant species in these forests. However, these are the areas on of the FNF that are most suited to whitebark pine as well, and where it has historically been able to compete very successfully, especially on the drier aspects and harsher, exposed slopes. In this post-blister rust landscape, subalpine fir has filled the vacancies left by the dying WBP, gradually becoming what appears to be nearly the exclusive forest type in this PVT. WBP dominance type covers only 3% of the forested area currently, and LP covers 8%. These two species do occur as minor components within some of the AF/S forests, though in the case of WBP it is very unlikely they will gain much in abundance into the foreseeable future.

About 23% of the cold PVT is in an early successional, seedling/sapling stage of forest development, and about 22% is in a non-forest grass, forb, sparse vegetation type. Some of these areas are sites that truly support only minimal tree growth, such as very rocky or shallow soils. About 14% of this PVT was recently burned (in the past 25 years) so some of these areas originate from recent fire. Some are areas that may have burned as much as 80 years ago but have yet to contain sufficient numbers of trees to be detectable as a forest type. Forest productivity is low and tree growth is slow in the cold PVT compared to lower elevations and sites with higher soil productivity. Re-establishment of a forest type after a fire or other disturbance (such as avalanche) can be very slow, taking many decades on some of the harsher sites (i.e. 50 or more years) for trees to establish and fully occupy the site again. These areas are in a persistent grass or shrub stage of development. Tree density in the cold PVT at all stages of development is often lower than in lower elevation forest types. Loss of whitebark pine in this PVT exacerbates this condition, as it could thrive on harsh sites where subalpine fir, spruce or lodgepole pine could not.

### ***Cool, Moderately Dry PVT group***

This group occurs mostly on the drier aspects at mid-elevations and in areas of cold-air flow at lower elevations. Though this group is spread widely across the FNF, it most commonly occurs as discontinuous patches and stringers within and along the edges of the extensive zone of cool/moist PVT group. The cool, mod dry PVT patches get somewhat larger and more continuous in the upper reaches of the Middle Fork and South Fork Flathead Rivers (MFk and SFk GAs). Sites within the cool, mod dry PVT can range from low to high productivity depending on soils, slopes and other site characteristics.

Primary tree species consist of Douglas-fir, lodgepole pine, subalpine fir and spruce. Western larch is present on some of the more moist sites within this PVT, and whitebark pine can be a minor component on the coldest sites. Lodgepole pine is often the most dominant species in the early and mid-successional stages, and this is the PVT group where lodgepole pine most often forms nearly pure, sometimes very densely stocked stands. Douglas-fir is also a common species in all stages of succession. In the late successional stage, Douglas-fir may be present as a persistent, long-lived overstory species in a stand dominated by subalpine fir. Subalpine fir is the dominant late successional species, though it is often sparse or only a relatively minor component of the stand through the early and mid-successional stages. Common understory plants include beargrass, blue huckleberry, dwarf huckleberry, kinnikinnick, common snowberry, grouse whortleberry, and pinegrass.

A mixed severity fire regime is characteristic of these sites and fires of all severities could occur. Low to moderate severity fires occurring relatively frequently tend to perpetuate Douglas-fir and sometimes lodgepole pine, while setting back the advancement towards a late successional condition by removing fire-sensitive subalpine fir and spruce. Douglas-fir would tend to be more favored by these low and moderate severity fires because it is more tolerant of fire than lodgepole and is able to regenerate in conditions of shade. High severity fires would favor lodgepole pine, well adapted to regenerating in large burned openings. The pure lodgepole pine stands that form on this PVT may be attributable to several reasons, including (a) frequent high severity burns over a long time periods have eliminated seed sources of other species; (b) intermittent lower severity underburns continually remove the shade-tolerant subalpine fir and spruce understory trees from the site; and/or (c) the dense stands that lodgepole pine can form inhibits the regeneration of even the most-shade tolerant species.

It is not always the site specific conditions that determine whether or how often forests on the cool, mod dry PVT will experience fire, but rather their location and distribution across the landscape. Because of the patch mosaic pattern of this PVT type across much of the FNF, the fire disturbance patterns in the surrounding forest strongly influence fire disturbance patterns in the cool, mod dry forests. The cooler, moist forests can act as a firebreak, preventing fire within these drier forest types from spreading very far. However, when the conditions are suitable for fire to spread in the moist forests, it is likely to sweep through these drier forest sites as well, often burning at high severity. This influence of the surrounding forests is central to an understanding of how fire as a disturbance factor functions on the cool, mod dry PVTs of the FNF.

### **Existing FNF forest conditions in the Cool, Moderately Dry PVT**

Compared to the other PVTs on the FNF, this PVT supports the highest proportion of seedling/sapling early successional forests, and one of the lowest proportion of large tree/late successional forest. These two are partially related, as recent fires have impacted substantial area within this PVT (about 21% of the PVT). Though this has created young, seed/sapling forests, it also removed thousands of acres of forest in the small, medium and large tree size classes.

The large tree size classes are mostly subalpine fir/spruce types, stands in later stages of successional development. Within these older stands, however, there is often a minor overstory tree component composed of long-lived, large diameter, early seral species. These overstory trees would mostly be Douglas-fir, but western larch would occur on some sites.

Tree species typical for this site are fairly well represented and dominance types relatively balanced in proportions, with subalpine fir/spruce type most common, but not far ahead of lodgepole pine and Douglas-fir. Most of the lodgepole pine stands are composed of small trees and probably densely stocked. Most of the Douglas-fir stands are medium tree size. The 13% of area in transitional forest (seedling/sapling from recent fire or harvest) is likely to be dominated by lodgepole pine or Douglas-fir, increasing the proportion of these forest types even more across the PVT area.

A very small but important component of ponderosa pine type occurs in this PVT, and most of these stands are medium or large tree sizes. Ponderosa pine competes well on the somewhat warmer sites within this PVT. Western larch also occupies a relatively small but important portion of this PVT. Low to moderate severity fire

perpetuates pine and western larch. Both species are fire tolerant, long-lived, and in later successional/old growth stages form stand structures highly beneficial to many wildlife species of concern.

### ***Cool, Moist PVT group***

This group is the most common on the FNF, making up 41% of the area. It is found across a wide range of elevations and aspects, but most common in mid elevation areas, and cooler, frosty areas at lower elevations. It forms large, continuous patches across most of the forest, especially in the NFk, MFk and the HH GAs. Forest productivity is moderate to high.

Most of the species common to the FNF can be found on this PVT. Subalpine fir and spruce are major species, present in forests at all successional stages. Douglas-fir, western larch and lodgepole pine are the most common forest types in early and mid-successional stages. Western white pine was historically common on the warmer sites within this PVT. Whitebark pine can occasionally occur within stands but sites are not cold enough for it to successfully compete with the other species. On the other end of the spectrum, ponderosa pine may occur within some stands but rarely in large numbers as sites are not warm enough for it to successfully compete. Understory plants are abundant, diverse in species, and form dense cover of forbs, shrubs short and tall, and grasses. Some common plants include pinegrass, queencup beadlily, beargrass, alder, menziesia, thimbleberry, blue huckleberry, dwarf huckleberry and grouse whortleberry.

Lodgepole pine can form nearly pure stands on this PVT type, especially where relatively frequent (<80 year fire-free interval), severe, large fires occur. However, it is just as commonly mixed with other early seral species, such as western larch and Douglas-fir. Lodgepole is also shorter lived and will often succumb to insect or other disturbance before the large tree/late successional stages are reached. Douglas-fir and larch can continue on into the late successional and old growth stages as long-lived, large diameter overstory species within stands that are usually dominated by spruce or subalpine fir. Western white pine used to fill this niche as well in many of these cool, moist PVT forests, though nearly all of the large, old overstory white pine trees are now gone due to blister rust.

Because of the moist forest types within this PVT, fire probably occurred less frequently than in drier forest types. These moist forests normally will catch fire only after a period of extended drying/drought conditions, allowing sufficient time for forest fuels (especially surface fuels) to dry out sufficiently. Fire-free intervals may range from 50 to over 140 years, depending on the site. When fires do occur, the relatively high amounts of forest fuels that have accumulated over time combined with the dry climatic conditions increase the chance for moderate to high severity, stand replacing fires. These fires can be very large in size as well, owing to the continuity of dense forests and fuel conditions within this PVT on the FNF. The burned, exposed soil and lack of competing ground vegetation after a fire is conducive to regeneration of early seral species. Large diameter western larch and Douglas-fir can survive moderate severity fire (as did western white pine in years past), and even in a large, stand replacing fire there may be scattered survivors or pockets of trees, or trees severely damaged but not-yet-dead. These trees provide seed for a new generation of trees. Lodgepole pine, as always, is ready to abundantly reforest the site as well, with the heat of the fire opening its cones and allowing spread of the seed.

### **Existing FNF forest conditions in the Cool, Moist PVT**

About a quarter of the forests in this PVT are subalpine fir/spruce dominance type. Close behind are Douglas-fir dominated forests. Lodgepole pine and western larch dominance type each comprise about 15% of the area, though these species also often occur as codominant or minor species in both subalpine fir/spruce and Douglas-fir dominated forests.

About a third of the forests are in the large tree/late successional stage, with subalpine fir/spruce types comprising the majority of this late successional forest type. Again, there are scattered, large overstory larch and Douglas-fir within some of these older stands as well. Douglas-fir in particular dominates the forests in medium tree size classes, while larch and lodgepole pine dominate in the seedling/sapling early successional stands. The recent fires have affected about 15% of the area, and much of this is currently within the “transitional forest” class, with

no dominant species yet detected. Many of these sites are regenerating to lodgepole pine and western larch, which will raise the proportion of these species on this PVT.

### ***Cool, Wet PVT group***

This group covers a small portion of the FNF, and represent the wettest forested sites (high water tables, water saturated soils, mountainside seeps, flat areas with poor drainage). These sites occur at mid to low elevations, as discontinuous, small patches and stringers scattered across the forest, usually limited to flat areas and drainage bottoms, streamside zones, springs and seepage areas. Forest productivity is moderate to high.

Spruce, subalpine fir, and western red cedar (warmer areas) occur on these sites. Small amounts of Douglas-fir, western larch, and western white pine also occur. Very occasionally western hemlock can also be found on these sites on the FNF. All these species may be found in all successional stages, with the long-lived spruce, Douglas-fir, larch and white pine persisting well into the late successional stages. Paper birch and quaking aspen are common on some sites. Understory plants are lush and abundant, with wet-site forbs, ferns and shrubs. Indicative species for the FNF include devils club, red osier dogwood and pacific yew.

These are the areas with the longest fire-free intervals, due to the wet forest conditions. Similarly to the cool, moist PVT, conditions where fires would occur depended on long periods of dry conditions and suitable weather parameters, which occurred even less frequently in these types compared to forests on the cool, moist PVTs. Fires spreading through the adjacent cool, moist forests would often skip over these wet forests. Thus forests on the cool, wet PVT may persist without fire for several centuries, and very old forests (e.g. old growth) often developed in these areas.

### **Existing FNF forest conditions in the Cool, Wet PVT**

This PVT contains the highest proportion of large tree size class/late successional forest of all the PVTs on the FNF. Over a third of the forests in this type are subalpine fir/spruce dominated, and most of these are medium or large tree size class. These conditions reflect both the tolerance of these species (particularly spruce) to high water tables and wet conditions, the cool conditions of most of these sites on the FNF, and the long period between fires where forests are able to achieve larger sizes and older ages. The remaining forests are a relatively even mix of Douglas-fir, lodgepole pine and western larch dominated forests, which also likely contain a substantial amount of spruce and subalpine fir as well. Western red cedar is known to occur as a minor species in some of the warmer, lower elevation forests of this PVT, mainly in the understory tree layers. Most sites on the FNF are too cool or not moist enough for cedar to compete successfully enough to dominate a stand.

The recent fires burned through about 14% of the area within this PVT. Spruce is likely to be the most common species that regenerates, but depending on site conditions and seed sources, Douglas-fir, lodgepole pine and western larch could also occur.

### ***Warm, Moist PVT group***

This group reflects conditions of high moisture and relatively productive soils, with the highest forest productivity of the PVTs on the FNF. It is most prevalent on the lower elevation benches and valley bottom in the north half of the SV GA. It also occurs on the moist benches and slopes at the far southern end of the NFk GA, and on similar sites in the Stillwater River drainage of the SMt GA. Though it covers a relatively small portion of the FNF, where it does occur it typically forms moderately large, contiguous patches, especially in the north half of the SV GA, where it is a major PVT in the low and mid elevation areas.

All the tree species of the FNF, except whitebark pine, can be found in this PVT. The warm, moist conditions sustain the growth of diverse and productive stands. Grand fir or western red cedar are the indicated climax species, meaning that given enough time they will dominate and be self-perpetuating on the site. However, as with many of the forest types in this ecosystem, this pure climax condition is rarely achieved. Rather, a “near-climax” condition develops, where large, long-lived, fire tolerant early seral species frequently persist within the forest for many centuries. On the warm, moist PVT, these trees are western larch, Douglas-fir, ponderosa pine and western

white pine. Understory forbs and shrubs are abundant and diverse. Shrubs common to these sites can be of particular value to wildlife, and include serviceberry, thimbleberry, rocky mountain maple, blue huckleberry and menziesia.

A mixed severity fire regime characterizes this PVT group. Though generally moist throughout, there is very wide gradient in site and moisture conditions across the PVT area, which influences how a fire may behave. The moist conditions keep the fire frequency relatively low overall. Similarly to the cool, wet types, these areas serve as firebreaks to ground fires, which may burn into the stand for some distance, crowning out in patches of trees, but die out when reaching moist fuels or duff layers. These types of low or moderate severity fires remove the fire-sensitive grand fir and cedar, but the fire-tolerant western larch, Douglas-fir, ponderosa pine and western white pine may survive. The fires create openings and burned sites where these species can regenerate. A mosaic of different forest structures (successional stages, size classes) and species mixes are produced at different scales – both within the individual stands and across the larger PVT area. This mosaic in turn influences how future fires behave across the landscape.

The FNF is subject to periodic drought conditions, and heavy fuel loadings occur in many of these stands because of the high plant productivity. Therefore, severe, stand replacing fires eventually occur within this PVT, which will create relatively large patches of early successional forest. Any of the early seral species mentioned above are likely to occupy and dominate the site at this early stage, depending on the available seed sources.

The warm, moist PVT contain the sites most suited to western white pine establishment and growth. Historically, forests on this PVT were most likely to support highest proportion of western white pine, which would occur in all successional stages.

#### **Existing FNF forest conditions in the Warm, Moist PVT**

Western larch and Douglas-fir dominated forests occupy nearly 70% of the warm, moist PVT. Most are small to medium tree size (mid successional), but some are large tree/late successional. The warm, moist PVT contains a relatively high proportion of large tree/late successional forest, which reflects the lower severity fire regimes and high proportion of long-lived, fire tolerant early seral species. Grand fir, western red cedar, and sometimes subalpine fir are present in some of these stands, but grand fir and cedar dominated forests are rare. This is related again to the persistence of the early seral species under the fire regimes, as well as to timber harvesting practices that favored early seral species.

A small but important component of ponderosa pine dominance type occurs in this PVT. Old forest structures composed of ponderosa pine provide valuable habitat for many wildlife species of concern on the FNF. The ponderosa pine dominated stands in this PVT are a mix of small, medium and large tree size classes, representing a range of successional stages. Ponderosa pine is very fire tolerant and was able to compete well on these sites under the historical mixed severity fire regime, and where fire was more frequent. Given their location, historical fire frequency on these sites may have been influenced through deliberate burning by Native Americans.

The warm, moist PVT contains the highest proportion of hardwood, or deciduous tree, forest types. These consist mainly of quaking aspen and paper birch. Though they cover a relatively small area, they are an important element in the overall ecosystem diversity and provide valuable habitat for a variety of wildlife species.

Very little (only 1%) of this PVT was affected by the recent fires on the FNF. The early successional forest conditions within this PVT are primarily due to timber harvesting over the past 30 or so years rather than fire.

#### ***Warm, Dry PVT group***

This group represents the warmest and driest sites on the FNF. The bulk of the PVT area lies in the south half of the SMt GA, where it is common on all aspects and elevations. It is also common in the low to mid elevation dry, warm aspects of the SFk and SV GAs. It is uncommon in the HH, MFk and NFk GAs, where it occurs as small, discontinuous and widely scattered patches on the driest and warmest aspects at lower elevations. Forest productivity is low to moderate on the warm, dry PVT.



Douglas-fir is the indicated climax species, but is also a major component of forests at all stages of succession. Ponderosa pine, western larch and lodgepole pine are associated species whose abundance varies considerably depending upon the site and location. On cooler sites, larch and lodgepole tend to be more common; on warmer sites ponderosa pine. Shrubs, forbs and grasses adapted to drier sites occur in the understory, with common ones being pinegrass, elk sedge, common snowberry, ninebark, oceanspray, dwarf huckleberry, kinnikinnick, and beargrass.

The warm, dry PVT group was characterized by a mixed severity fire regime consisting predominantly of low to moderate intensity fires. Fires tended to be more frequent. In some parts of this PVT, fire frequency was likely influenced by deliberate burning by Native Americans. Because of the lower forest productivity and more frequent fires, forest fuels were maintained at relatively low levels, which reduced fire intensity.

Fire was historically an important agent in controlling density and species composition. Douglas-fir is partially tolerant of shade and is very tolerant of dry conditions (especially during the seedling and sapling stage). It can proliferate on these sites, and over time stands can become very dense and multi-storied. Frequent low to moderate severity fires would favor larch and ponderosa pine, which are more fire tolerant at all sizes, and decrease proportions of Douglas-fir. Dense stands of smaller diameter trees would be converted to more open park-like forests. Mixed severity fire regimes would tend to create a very diverse patch mosaic across the area composed of a diverse mix of forest structures. These would include patches of early successional openings where crown fires may have killed all the trees; patches of park-like open forest where fire has thinned the trees; patches of dense single-storied Douglas-fir dominated areas where fire had not burned for many decades; and patches of multi-storied forest of varying densities and species mixes, where a fire or series of fires had selectively killed trees of all age, size and species.

These sites are the areas where ponderosa pine is most suited and where it is best able to become a dominant or co-dominant species. Ponderosa pine, and in particular the mid and late successional ponderosa pine forest structures, are of high value to a diverse array of wildlife species of concern on the FNF.

#### **Existing FNF forest conditions in the Warm, Dry PVT**

The warm, dry PVT contains the least proportion of large tree size/late successional forest of the PVTs. It also has a relatively low proportion of early successional seedling/sapling forest. Some of this is likely attributable to the exclusion/suppression of fire and to natural succession of forests that were earlier burned or harvested.

Nearly 50% of the area in the warm, dry PVT is in the Douglas-fir dominance type. The vast majority of these stands are small to medium tree sizes. Western larch and lodgepole pine are a distant second in proportion of the area, at 10 and 13% respectively. Though most of these stands are also small to medium trees, they do comprise a disproportionate amount of the seedling/sapling early successional forest in this PVT. As they move into mid successional stages, this should reduce the proportion of Douglas-fir to some degree. In addition, about 12% of this PVT burned in recent fires, and some of the area currently in the transitional forest type may be progressing towards stands dominated by western larch or lodgepole pine.

Ponderosa pine dominance type comprises only 2% of this PVT, but it is an important component of the overall forest and ecosystem diversity. It is also distinctive in that about 15% of this ponderosa pine type is large tree size class, which has the highest potential of containing the highly valued late successional stand structures. 45% of the dominance type is in the medium tree size class, which could indicate that much of this type is progressing on a favorable trajectory towards the late successional stages.

Inclusions of subalpine fir/spruce dominance type occurs in this PVT, and these areas are probably scattered throughout the area, occurring in the moist and wet sites along streams and riparian areas. Medium to large trees are predominant, and are most likely spruce trees.

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